

Section 1.2

Chester Ismay, Tom Linton

Ripon College, Central College

“For me, I am driven by two main philosophies:
know more today about the world than I knew
yesterday and lessen the suffering of others.
You’d be surprised how far that gets you.”

- Neil deGrasse Tyson

Suppose you are testing the hypotheses $H_0 : \pi = 0.25$ and $H_a : \pi < 0.25$ and the observed statistic, \hat{p} , is equal to 0.30 with a sample size of 100.

(1) If you are using a proportion as your statistic, where do you expect your null distribution to be centered?

- A 0.25
- B 0.50
- C 0.30
- D 30
- E None of the above

Suppose you are testing the hypotheses $H_0 : \pi = 0.25$ and $H_a : \pi < 0.25$ and the observed statistic, \hat{p} , is equal to 0.30 with a sample size of 100.

(2) If you are using a count as your statistic, where do you expect your null distribution to be centered?

- A 25
- B 50
- C 0.30
- D 30
- E None of the above

- (3) Which of the following is the correct definition of “ p -value”?
- A The proportion of successes in our sample
 - B The probability the null hypothesis is true
 - C The proportion of times the observed statistic occurs out of the total number of replications in the null distribution
 - D The chance of obtaining a sample statistic as extreme or more extreme than the observed statistic, assuming the alternative hypothesis is true
 - E None of the above

(4) Which of the following is the correct general form for the null hypothesis when testing one proportion?

- A $H_0 : \pi = 0.5$
- B $H_0 : \hat{p} = \text{hypothesized parameter value}$
- C $H_0 : \pi = \text{hypothesized parameter value}$
- D $H_0 : \pi = \hat{p}$
- E $H_0 : \pi \geq \text{hypothesized parameter value}$

A legendary story on college campuses concerns two students who miss a chemistry exam because of excessive partying but blame their absence on a flat tire. The professor allows them to take a make-up exam, and sends them to separate rooms to take it. The first question, worth five points, is quite easy. The second question, worth ninety-five points, asks: “Which tire was it?”

Do students pick which tire went flat in equal proportions? It has been conjectured that when students are asked this question and forced to give an answer (left front, left rear, right front, or right rear) off the top of their head, they tend to answer “right front” more than would be expected by random chance.

To test this conjecture about the right front tire, a recent class of 28 students was asked if they were in this situation, which tire would they say had gone flat. We obtained the following results:

Left front	Left rear	Right front	Right rear
6	4	14	4

(5) What are the observational units?

A The students.

B The four tires.

C Whether students select *right front* more than expected.

D Whether or not students select *right front*.

(6) What is the variable of interest in this study?

- A The long run probability that a student picks the right front tire.
- B The proportion of students who picked the right front tire.
- C Which tire each student picked.
- D How many students picked each tire.

(7) What is the parameter of interest in this study?

- A The proportion of students in the class who picked the right front tire.
- B Which tire each student picked.
- C The long run probability that a student picks the right front tire.
- D The long run probability that more than $1/4$ of the students will pick the right front tire.
- E $\hat{p} = \frac{14}{28}$.

(8) What is the appropriate null hypothesis for this setting?

A $H_0 : \pi = 0.5$

B $H_a : \pi > 0.25$

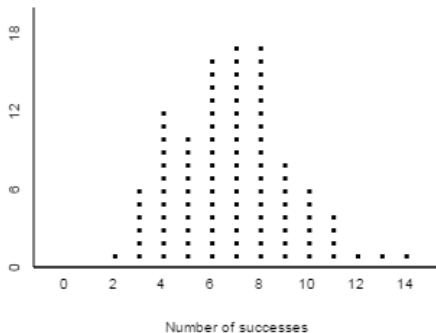
C $H_0 : \hat{p} = 0.5$

D In the long run, students will pick each tire equally often.

E In the long run, more students than chance predicts will pick the right front tire.

(9) Recall that the study had $\hat{p} = \frac{14}{28}$ students pick the right front tire. Shown below are 100 simulated values for $X =$ the number of students (out of 28) who picked the right front tire, assuming $\pi = 0.25$. Use the results to estimate the p -value for this test of significance.

- A 0
- B 0.01
- C 0.03
- D 0.58



- Do we have preconceived notions of what persons with a certain common name look like?

- Do we have preconceived notions of what persons with a certain common name look like?
- For example, do people automatically construct an image in their head for a name like Sarah or Brian?

- Do we have preconceived notions of what persons with a certain common name look like?
- For example, do people automatically construct an image in their head for a name like Sarah or Brian?
- You will soon be shown a picture of two men named Bob and Tim, and you will be asked to decide who is on the left, Bob or Tim, based solely on the photos.

(10) Who is on the left?



A Bob

B Tim

- Standardized statistic (z -score)
- The mean of the null distribution
- The standard deviation (SD) of the null distribution
- One- or two-sided test
- p -value